INCISION AND INFILLING OF THE LAPA PALEOVALLEY IN THE CONTEXT OF THE LATE PALEOZOIC ICE AGE: PARANÁ BASIN, SE BRAZIL

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The Lapa sandstone – an informal, late Carboniferous, sand-rich unit of the Paraná Basin (Itararé Group) – is an elongated, low sinuosity sedimentary body exposed from Lapa (PR) to Rio Negrinho (SC). The sandstone is easily identified through aerial images since it forms a prominent ridge about 80 km long and 1 km wide. The succession is about 100 meters thick and is incised on mud-rich glacial deposits of the lower Itararé Group. Because of such characteristics, the unit has long been considered the result of infilling of a paleovalley or paleochannel. Special attention has been given to the Lapa sandstone because it is considered the best outcrop analog for seismically detected valley-fill hydrocarbon reservoirs in subsurface. Besides, valley-fill sandstones are major exploratory targets in glaciated basins from the Ordovician to the Pleistocene. The origin of the Lapa paleovalley and its equivalents in subsurface are still debated and three main hypotheses were already discussed in the literature: 1) subaerial incision caused by a relative sea level fall and subsequent infilling during base level rise; 2) infilling of a fjord-like structure cut by glacial erosion; 3) infilling of a subglacial tunnel-valley. This work aims to contribute in the interpretation of the Lapa sandstone under the lights of recent published information on glacial environments and the analysis of new data including remote sensing, facies description, stratigraphic logging, paleocurrent analysis and eletroresistivity acquisition. Field work allowed the identification of fourteen sedimentary facies, including mostly massive to stratified sandstones and conglomerates, besides minor contribution of massive diamictites, which were grouped into three genetic facies associations. In stratigraphical order these include A) normally graded, massive to stratified conglomerates and sandstones interpreted as hyperconcentrated to concentrated-flow deposits related to direct input of meltwater into a proglacial subaqueous environment; B) medium to fine-grained sandstones with symmetric and asymmetric ripples, plus horizontally laminated and trough/planar/sigmoidal cross-stratified sandstones, which were interpreted as shallow marine/deltaic environments with deposition influenced by fluvial-derived unidirectional currents and wave activity; C) trough/planar cross-stratified, poorly to moderately sorted sandstones and cross-stratified conglomerates, interpreted as fluvial deposits. Paleocurrents taken from cross-stratification, ripples and imbricated clasts display mean vectors to the NW parallel to the sandstone body, in agreement to previously published data. The facies association A has a backstepping stacking pattern, suggesting a progressive retreat of the meltwater input-point due to ice-margin recession. The presence of overlaying transitional to fluvial facies associations indicates a later development of ice-free shorelines. Considering the three working hypotheses, it is emphasized that a relative sea level fall would generate a widespread unconformity with ~~and~~ a tributary valley network instead of a single valley. Moreover, fjords are the result of erosion by valley glaciers on bedrock in high-relief glacial setting, which does not match the low-relief intrabasinal setting in which the Lapa paleovalley developed. The tunnel-valley hypothesis, on the other hand, is supported by the nature of facies associations and stacking patterns, relationship with underlying deposits as well as the external morphology of the sandstone body.

KEY-WORDS: LATE PALEOZOIC ICE AGE; GLACIAL PALEOVALLEY.